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Lincolnshire Naturalists' Union Transactions.

1923.

Edited by
ARTHUR SMITH,
F.L.S., F.E.S.,
AND
R. W. GOULDING,
F.S.A.

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BRITISH MUSEUM
NATURAL HISTORY

Lincolnshire Naturalists' Union.

Founded June 12th, 1893.

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Revised to March, 1924.

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Any corrections in the List will be gladly received by the Secretary.

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Members are reminded that Subscriptions should be paid to the Hon. Assistant Secretary, Mr. R. W. GOULDING, F.S.A., Welbeck Abbey, Worksop, who will send receipts.

The minimum Subscription is 5/-, payable in advance. The payment of one sum of £5 constitutes a life member.

TRANSACTIONS.

Back Numbers of the parts issued are still on hand, and may be had from the Hon. Secretary, ARTHUR SMITH, F.L.S., etc., City and County Museum, Lincoln.

OBJECTS AND RULES.

The Lincolnshire Naturalists' Union was formed to promote the thorough investigation of the fauna, flora, and physical features of the county, to bring together workers interested in the same pursuits, to increase the interest in, and study of, every branch of Natural History.

Field Meetings are held four or more times a year. There is also one annual general meeting held at Lincoln, for the transaction of the business of the Society, and for the President's address.

Members will be entitled to free admission to all meetings and excursions.

At ordinary Field Meetings, when the Union is not entertained, members may introduce two friends, not more, except by the President's consent.

When the Union is entertained at any Field Meeting, the Meeting is to be open to members only, except such friends as the Entertainer may invite.

Ladies and Gentlemen desirous of becoming Members of the Union should apply to the Hon. Secretary for nomination papers. A new Member requires to be proposed and seconded, and the paper must be counter-signed by the President or one of the Vice-Presidents of the Union.

Correspondence with respect to Field or Sectional Meetings and organisation generally should be addressed to ARTHUR SMITH, Museum, Lincoln.

It is hoped that all Members will interest themselves in the work of the Union, especially by obtaining new members and communicating with the Sectional Officers respecting new records, etc.

NEW MEMBERS.—Members can greatly assist the Union by forwarding to the Secretary, the names of ladies and gentlemen whom they think at all likely to take an interest in the work of the Union.

Proposal Forms will be sent to any Member applying for them.

LINCOLNSHIRE NATURALISTS' UNION.

Statement of Account from 1st January to 31st December, 1923.

RECEIPTS.	£	s.	d.
By Balance in Bank, 31st December, 1922 ...	16	19	7
,, Balance in Secretary's hands, 31st Dec., 1922	0	10	9
,, Members' Subscriptions	27	11	0
,, Copies of Transactions sold	0	5	0
	£45	6	4

PAYMENTS.	£	s.	d.
To unpresented cheque, 1922	0	15	9
,, Mr. Sneath for cheque omitted, 1922... ...	0	17	4
,, Subscription to the 'Naturalist'	0	10	6
,, Stationery and Printing of Transactions and Notices	17	17	6
,, Postages	3	3	8
,, Expenses of Meetings	2	7	11
,, Balance in Secretary's hands, 31st Dec., 1923	0	2	10
,, Balance in Bank, 31st December, 1923 ...	19	10	10
	£45	6	4

SEPARATE ACCOUNT.

Life Members' Subscriptions invested in P. O. Savings Bank.

	£	s.	d.
Amount shown on Balance Sheet for 1922	61	18	9
Interest to 31st January, 1923	1	13	1
	£63	11	10

Examined and found correct, January, 1924,
A. E. GRAY, *Auditor.*

R. W. GOULDING, *Treasurer.*

PRESIDENTIAL ADDRESS

TO THE

LINCOLNSHIRE NATURALISTS' UNION,

delivered at Lincoln, 22 November 1923,

by G. A. GRIERSON, O.B.E., M.B., C.M.

LESSONS FROM A LIMITED AREA.

Let me first thank you for the honour you have done me in placing me in the presidential chair, especially as I am painfully conscious of the fact that I have done nothing to earn that honour. Since I first joined the Union, about the year 1896, I feel that I have received from it much more than it has received from me. When I look back on the men who have preceded me, most of whom it has been my privilege to know—Cordeaux, the two Fowlers, Burton, Peacock, Roebuck—not to mention the enthusiasts who are still, fortunately, with us, and when I think of the enduring and painstaking work which they have done, I can only wonder why I am here, and plead that the duties of an exacting profession have prevented me from doing as these men have done, and have allowed me only occasional intervals to attend the field meetings, and to pick the brains of the enthusiasts and experts who are never absent from these enjoyable excursions.

Unfortunately for me, exalted positions involve corresponding responsibilities, and I am told that it is expected of the president before he leaves the chair that he shall give what is called a presidential address. It may be true that this is the only piece of real work expected from him during his year of office, but that does not make it any easier, especially if one is not an authority on anything.

After much searching in the clouds for a subject, I have resolved to confine myself to earth, and to inflict on you a few thoughts suggested by occasional visits during the past summer to a piece of unspoiled ground within two miles of Grimsby.

The area is known as Freshney or Aylesby Bog, and has been visited by the Union on several occasions. The soil is peat and alluvium, traversed by the River Freshney, and there are several holts, consisting mostly of oak and ash and osier, distributed throughout the area. There are also a number of blow holes, connected with the underlying chalk, a combination of natural features which should favour a varied flora and fauna, especially when we find that the area is isolated from the main roads and from human habitations.

I think it was Huxley who referred to field naturalists as "the camp followers of science". I therefore propose, in addition to calling your attention to the mere names of some of the uncommon plants and animals found in the area described, to try to remove some of the opprobrium of Huxley's phrase, by recording some of the thoughts suggested, especially by the plants met with, during walks in this unspoilt area at different seasons.

In the early spring the most conspicuous plants to be seen in flower are the Coltsfoot and the Butter-bur, which send out their flowers before their leaves. Why? If you dig up the root-stocks you will find the reason; they have been thrifty, and during the previous summer, when their breadwinning organs, the leaves, have been in full work, the plants have stored up a large quantity of surplus nutriment, in the form of starch, in their underground stems, and when the warmth of spring arrives, this is converted into soluble sugars, which enable the flowers to get all the nourishment they require in order to perform their function of producing seed, with which to carry on the race. The truth of this can be confirmed by examining microscopic sections of the rhizome in early spring, when the cells will be found loaded with starch, and again later, when it will be found that most of the starch has disappeared.

Later in the spring the male flowers of several species of Willow form a conspicuous feature in our landscape: some of these are cultivated for basket-making, many of them appear to be wild. The most beautiful of the latter is the Bay-leaved Willow *(Salix pentandra)*. Less conspicuous, but useful for

stimulating the line of thought suggested by the Willow, are the Alder and the Hazel; the latter are purely anemophilous plants, that is, they are dependent on the wind for fertilisation, the Willow is probably partly so. In the Alder and the Hazel, the male and female organs are in separate flowers but on the same tree (monoecious). In the Willow, the male and female flowers are on separate trees (dioecious). Noting these facts carries us back to the researches of Darwin, some sixty years ago. He pointed out that in wind-fertilised plants the chances of fertilisation were so slender that it was necessary that there should be produced what appears to be a very wasteful quantity of pollen, so that there may be a certainty of some of it reaching the female flowers and fertilising them. Bucketfuls of pollen have been swept off the decks of vessels approaching North America, and the ground in Missouri has been seen covered with pollen which must have come from the pine forests 400 miles to the south. Pollen has also been found in large quantities on the snow of the higher Alps. It will thus be seen that for every ovule fertilised there must be an enormous quantity of pollen wasted, and, as pollen contains a large amount of nutritive material, it would be a distinct advantage to any plant if it could obtain the same result with less waste. As a matter of fact, the higher we go in the plant scale, the less waste there is in the attainment of results. Darwin also proved by an elaborate and painstaking series of experiments that cross-fertilised flowers produced more seeds and more vigorous plants than those which were self-fertilised. But, you will say, in the Alder and the Hazel, where the male and female flowers are on the same tree, how are you going to prevent self-fertilisation? If you look at the position of the male and female flowers, you will see how this is made at least improbable: the female flowers grow in groups on the upper side of the branches, and point upwards, the male hang downwards from the lower side; in addition to this, the male and female flowers on the same tree mature at different times.

Continuing the same line of thought, let us go back to the flowers of the Coltsfoot, and compare them with those of some of its near relatives which dot the ground around us—the

Daisy, the Dandelion, and the lowly but ubiquitous Groundsel.

The Groundsel is inconspicuous, and flowers all the year round. These two factors lessen its chance of being fertilised by insects, but, although cross-fertilisation is a good thing for the vigour of the race, self-fertilisation is better than no fertilisation; the Groundsel has therefore elaborated a very simple but effective method of fertilising itself. The anthers form a column closely applied to the style, and the style as it grows in length carries with it by means of its hairs some of the pollen from the anthers; when the stigmas expand, this falls on them, and that it is effective is proved by the fact that plenty of seed is always produced, even in bad weather—which any gardener can testify!

The Daisy, with its gaudy ray florets, developed at the expense of the more essential organs, attracts numerous insect visitors. The Coltsfoot also attracts numerous insects, not by the gaiety of its dress, but by the more substantial lure of its nectar, which is produced by nectaries developed at the expense of the abortive ovaries of the male florets, which are in the centre of the capitulum and surrounded by the females.

In the Dandelion all the florets are perfect, and all the corollas are ligulate, so that the capitulum makes a brave show and attracts numerous insect visitors—Muller has seen it visited by over a hundred species of bees, butterflies, and other insects. In spite, however, of the practical certainty of fertilisation being effected in this way, the Dandelion has another string to its bow; there is an arrangement similar to that present in the Groundsel; the elongating style carries with it on the hairs of its outer surface some pollen, and if by any chance the stigmas have not received a supply from their insect friends, they curl round and lick up some of the pollen from the brush of hairs on the outer surface. There can be little wonder that a plant which makes so sure of producing seed, and which, in addition, takes such pains to distribute it, should be so ubiquitous.

A little later in the spring, *Valeriana dioica*, *Orchis mascula*, *O. maculata*, and *O. morio* attract our attention. The little

Marsh Valerian is interesting for two reasons; it bears male, female, and hermaphrodite flowers in the same cyme, and, although it is found throughout Europe and over a large area of England and Southern Scotland, yet it is absent from Ireland. Why it should be absent from Ireland seems to offer an ecological problem for some of our scientific naturalists—I can see in its attempted solution a very laborious quest. The Orchids take us back to the means developed by plants to secure fertilisation, and represent the highest development of economy combined with efficiency for the attainment of this essential of the continuity of the race. No better plant can be found than *Orchis mascula* for the illustration of this highly developed mechanism. Many of you are no doubt familiar with the experiment of pushing the point of a pencil into the mouth of the flower just above the stigma and then withdrawing it with the two pollen masses on their stalks adhering to it, and with the fact that these pollinia, at first upright, gradually bend over until, in about half a minute, they have assumed a position at right angles to their original one. Let us enquire into the significance of this: note first that the pollen masses form with the subjacent stigma a column, their stalks being hidden by a flat process called the rostellum. When an insect visits the flower in search of nectar, its proboscis pushes aside the rostellum, just as the pencil did, and the pollinia adhere to it. By the time the insect reaches another flower the stalks have bent over and the mass of pollen is pushed on its stigma; if the bending did not take place they would miss their mark, for the stigma lies at a lower level than the pollen masses. It is interesting to recall the fact that Darwin's great work on the Fertilisation of Orchids was done amid the storm of abuse and criticism and misunderstanding which followed the publication of the "Origin of Species"—just about sixty years ago.

As spring gives way to summer most of the common flowers of marsh and woodland smile at us in the course of our rambles. I remember at the field meeting of 1910 finding a few solitary plants of the beautiful purple-anthered *Cardamine amara* in this area—I think the find was recorded in the *Trans-*

actions. This year I visited the same spot on several occasions, without finding my old friend: one lucky day, however, I saw in a pool in one of the holts a mass of white flowers which I thought were Common Water-cress, but it suddenly struck me that it was too early for *Nasturtium* to be in flower and fruit; a closer examination followed, which proved it to be *C. amara.* This pool was some distance from the old spot, and no more plants were found in the neighbourhood. There are four British species of *Cardamine: hirsuta* and *pratensis* are common, *amara* and *impatiens* are rare or local. Why? I remember the delight with which I recognised *impatiens* growing in a shady walk leading to the ruins of Castle Campbell, in Scotland; that must be forty years ago, but I do not find myself any nearer the solution of the problem as to why *amara* and *impatiens* should be rare in this country, and *pratensis* found in every marsh and wet meadow. *Ars longa, vita brevis.*

It is interesting in the late summer to find the two Loosestrifes growing in great luxuriance. The great Yellow Loosestrife *(Lysimachia vulgaris)* with its cymes of yellow flowers is found in one very limited area only: it is almost smothered by Osiers, and its home is known only to the initiated, as the Osiers have to be pushed aside for some distance before it comes into view. Once the favoured spot is reached the plants are found growing to the size of bushes. I have seen it growing well in a small town garden, and yet in a state of nature it does not seem to have the power to spread its offspring. The Purple Loosestrife (*Lythrum Salicaria)* is found dotted about in the marshy ground. Why *Lysimachia vulgaris*, belonging to the Primrose order, and *Lythrum Salicaria*, having an order almost to itself *(Lythraceae)* should both be called Loosestrife offers a problem for the solution of those interested in common plant names. The Purple Loosestrife, like its yellow neighbour, has also a reputation for not being able to spread to the surrounding ground, in spite of the fact that it can be grown quite easily in an ordinary garden. Darwin's researches on the Purple Loosestrife have made it famous. He says: "it offers a remarkable instance, how profoundly ignorant we are of the life conditions of a species. Naturally

it grows in wet ditches, watery places, and especially on the banks of streams, and although it produces so many minute seeds, it never spreads on the adjoining land. Yet, when planted in my garden, on clayey soil lying over chalk, which is so dry that a rush cannot be found, it thrives luxuriantly, grows to above six feet in height, produces self-sown seedlings, (and which is a severer test) is as fertile as in a state of nature. Nevertheless, it would be almost a miracle to find this plant growing spontaneously on such land as that in my garden". In his investigations of the structure of the flower and its relation to fertilisation he elicited some most remarkable facts. He found that there were three female forms, which differ in the length and curvature of the style, in the size and shape of the stigma, and in the number and size of the seed. There are also three sets of stamens (of a dozen each) differing from one another in the length, curvature and colour of the filaments, in the size of the anthers, and especially in the colour and diameter of the pollen grains. Each form bears half-a-dozen of one kind of stamen, and half-a-dozen of another, but not all three kinds. The three kinds of stamen correspond in length with the three kinds of pistil. It would weary you to go into the details of this very intricate research: it is sufficient for our present purpose to note that it is only pollen from the longest stamens which will fertilise the longest pistil, from the mid length stamens the mid length pistil, and from the shortest stamens the shortest pistil. The plants are fertilised by bees, butterflies, and flies, which are tempted by the nectar secreted at the base of the ovary, and the remarkable fact emerges from the research that the curvature and arrangement of the stamens and pistil are such that the insects will generally carry the pollen of each form from the stamens to the pistil of corresponding length, and also that the greater the irregularity in length between the pistil and the set of stamens, the pollen of which is employed for its fertilisation, by so much is the sterility of the union increased. There are no exceptions to this rule. The whole research is set out clearly in Darwin's "Forms of Flowers", which although sixty years old will well bear re-reading.

I was much astonished to find Hops and Gooseberries and Red Currants growing in one of the holts. They can scarcely be escapes, and must have had their seeds brought by birds. Among the remarkable features of the landscape here are the large clumps of *Carex paniculata*, dotted about in the marsh and woodland, some of them in the woodland being festooned with Hops, producing a quite tropical impression. The Tway-blade appears to flourish in marshy ground around one of the holts—quite an unusual situation, and in another holt alongside a drain there is a colony of Hemp Agrimony. Neither of these plants appears to grow anywhere else in the neighbourhood. In his comments on the 1910 meeting, Mr. Peacock remarked on the large Ash and Oak holt that the Ash seems out of place on fenland peat, on which it never flourishes, but thinks that the limy water from the blow holes accounts for its being so well established. He also notes the remarkable absence of *Erica* and *Calluna*, which are so frequently found flourishing on peat. *Menyanthes*, *Parnassia* and *Schoenus nigricans*, typical peat plants, have been recorded for the area, although I fear that the beautiful Grass of Parnassus has now disappeared. They are interesting remnants of the rearguard of a peat loving flora, like *Samolus Valerandi* found by Mr. Reeves in 1904, but now, I fear, extinct. The Adder's Tongue and the Moonwort have been found on a grassy bank sloping down to the bog land, and are sufficiently local to be worth mentioning. I am indebted to Mr. G. Allison, of the Grimsby Naturalists' Society, for the following list of Sedges found in the bog: there are fourteen species, and they have been confirmed by experts:—

Carex panicea, *paniculata*, *remota*, *pulicaria*, *ovalis*, *flava*, *praecox*, *Goodenovii*, *ampullacea*, *paludosa*, *disticha*, *glauca*, *vulpina*, *hirta*.

Mr. Allison has also kindly furnished me with some notes on the more uncommon Mosses and Liverworts found in the area. *Ptilidium pulcherrimum*, a rare Hepatic, was found in a single station on the trunk of an ash tree. In the bog proper the predominating mosses are: *Hypnum cuspidatum*, *Amblestygium filicinum*, *A. Aduncum and A. Hypnum, and Climaceum dendroides.* *Eurhynchium pumilum* is found in a few places near the bog, on

the ground, and on the base of tree trunks, but it has not been found in fruit; *Tortula onutica* on a tree trunk in Little Coates village, also barren. *Dicranowesia cirrhata* and *Hypnum commutatum* and *Weisia crispa* are found in the locality. *Ulota Phyllantha* and *U. Bruchii* were found in cushion on a single branch of ash sapling in 1912 by Mr. J. J. Marshall. *Brachythecium populeum* was also found by Mr. Marshall on old stumps of trees, and *Homalia trichomanoides* with fruit on stumps.

I can only refer briefly to the fauna of this interesting area. The Badger, the Otter, the Weasel, the Stoat, are to be found. Mr. Bagshaw, of Grimsby, informs me that the Kingfisher, the Tawny and Little Owls, and the Long Eared Owl, the Woodpecker, the Kestrel and Sparrowhawk, Tits, Wrens, Buntings, the Sedge and Grasshopper Warblers, Wild Duck, Snipe, and Turtle Doves, have all been seen by him in the course of his rambles here, and I am informed by Mr. Skelton that about eighty kinds of birds' eggs have been found within the area.

I am indebted to our ex-president, Dr. Wallace, for some notes on the rarer insects. He says: "This area, teeming with insect life, has always been a happy hunting ground for the entomologist. One can but mention species of outstanding note. It was here that our secretary, Mr. A. Smith, took a specimen of the Pale Clouded Yellow (*C. hyale*). Among moths, *Tapinostola fulva* Hb. flies softly amongst the rushes on September afternoons. Of beetles, *Telephorus paludosus* Fall is found commonly every year, though it is more characteristic of mountainous areas. The very rare and local *Cryptocephalus exiguus* Schn. occurs abundantly and has few other British habitats. Of the Diptera two of the most important records are *Dicranomyia ornata* Mg., found under the leaves of the Butter-bur, and *Tripula Diana*".

I have tried, in the short time at my disposal, to convey to you, albeit in a somewhat disconnected manner, some of the thoughts which suggest themselves to a student of Natural History who by force of circumstances, is compelled to live in a large town. I have no doubt that areas similar to that of

which I have endeavoured to give you a picture, are to be found within easy distance of all large towns, so that he who takes country rambles for health's sake need never let his brain lie fallow. Gilbert White is an excellent example of what can be done by an earnest and industrious soul living in the heart of the country, but it is not always realised that even the busy townsman can do something for posterity as well as for his own mental and physical health by indulging in a natural history hobby.

I have been reading a very simple and altogether delightfully garrulous book entitled, "The Recreations of a Country Parson". The writer, the Rev. A. K. H. Boyd, who was a contemporary of Darwin, says, "I wish to assure the man, shut up in a great city, that he has compensations and advantages of which he probably does not think. The keenness of his relish for country scenes, the intensity of his enjoyment of his occasional glimpses of them, counter-balance in a great degree the fact that his glimpses of them are but few.....It is the man in populous cities pent, who knows the value of green fields".

We have it also on the authority of Wordsworth that—

"One impulse from a vernal wood
May teach you more of man,
Of moral evil and of good,
Than all the sages can"!

PRACTICAL PLANT ECOLOGY, by A. G. Tansley, M.A., F.R.S. (London: Allen & Unwin, 7s. 6d.).

This is the first English book dealing with the subject, and it is intended as a guide for those who are attracted to ecological work, but are uncertain how to set about it. This interesting volume contains carefully written studies of various ecological problems, and several explanatory charts.

THE GANNET.—A pair of Gannets, in mature plumage, visited Scothern, 13 June 1923. A. Flint, Scothern.

WILD GEESE.- There was a considerable immigration of these at Whitton and Winteringham, 8 and 9 November 1923. Large numbers landed in an exhausted condition. Gales and rough weather prevailed. C. Street, Lincoln.

REPORT OF THE HON. SECRETARY, 1923.

I have pleasure in reporting that the year 1923 has been our most successful year since 1914. The Field Meetings have been well attended. Seventeen new members have been elected, the total number on the roll at the end of the year (including 8 Life Members) being 130. Several members who had withdrawn from the Union in consequence of their absence from the County on war service have resumed their membership, some of them being excellent workers.

The One-Hundred-and-Twelfth Meeting was held at Habrough on June 7th. The area around Newsham Lake was worked, and new divisional records were made.

The One-Hundred-and-Thirteenth Meeting was held at Twyford Forest, July 5th. Under the leadership of Mr. H. Preston, F.G.S., and Miss Stow, the party worked this wooded area, and visited the *Camp*. Among the plants that were seen were the Butterfly Orchis and the Wood Vetch.

The One-Hundred-and-Fourteenth Meeting was held at Brandy Wharf, August 15th. This meeting was particularly interesting from a botanical point of view, the records including *Equisetum hyemale* (in its old habitat near Moortown Station), *Stellaria aquatica*, *Œnanthe phellandrium*, *Peucedanum palustre*, *Conium maculatum*, *Helminthia echioides*, *Samolus Valerandi*, *Butomus umbellatus* and *Alisma ranunculoides*. Several divisional records were made in conchology. Miss Joan Gibbons gave much assistance in the organization of this successful meeting.

The One-Hundred-and-Fifteenth Meeting took place at Bardney, September 13th, and it was the best attended meeting of the season. It proved to be an interesting re-union of old friends and fellow-workers, and was attended by several new members who were present at a Field Meeting for the first time. The river-side and woodland were well worked, and many notes were taken. The botanists were particularly interested in *Helminthia echioides*, *Senecio viscosa* and *Stellaria aquatica* on the railway bank; *Diplotaxis muralis* in the same place; and *Trifolium fragiferum*, by the side of the wood.

Several members said that they had never before seen Hemlock (*Conium maculatum*) and Teasel (*Dipsacus sylvestris*) in such abundance. Saw-wort (*Serratula tinctoria*) was found, and *Leontodon autumnalis* was extremely plentiful. The Rev. W. W. Mason came across *Calamagrostis epijegos*. Mr. C. S. Carter found a fine Orthopteron (*Meconema varium*), not previouly recorded for the County, and several land and freshwater shells new to the division.

On the occasion of each of these excursions the weather was favourable, and our thanks are due to the gentlemen who granted permission for their property to be visited, as well as to all those who helped to organize the meetings.

It is with much regret that I record the deaths of two of our members, namely Sir Henry C. W. Hawley, Bart., and Mr. Joseph Larder.

Sir Henry Hawley was born in 1876, and succeeded his father as sixth Baronet in 1919. He was elected a member of the Union in 1904, and was our President in 1915-6. He was expert in mycology, and was always willing to place his knowledge at the disposal of his fellow-members. He died 18 November 1923.

Ten days later, Mr. Joseph Larder, of Louth, succumbed to a long and painful illness. He was one of the founders of the Union in 1893, and he took very great interest in our proceedings. He was one of the most competent botanists in the County, and he had a thorough knowledge of the flora of the Louth district. He had for many years been Secretary of the Louth Antiquarian and Naturalists' Society, and he will be greatly missed.

ARTHUR SMITH.

Since the end of the year, the Union has suffered a third serious loss, and I am very sorry to announce that Mr. John Singleton Sneath died February 8th, 1924, in his 84th year. He was one of the foundation members of the Union, and until his health failed a few years ago, he was nearly always present at the meetings, paying particular attention to botany. He was our Treasurer from 1905 to 1922.

A. S.

SECTIONAL OFFICERS' REPORTS, 1923.

CONCHOLOGY.

J. F. Musham, F.E.S.

My report is a brief one, but I am glad to say that much valuable work has been done during the year, and the investigations made at the Field Meetings have resulted in the addition of many records to our divisional lists.

The new records for Div. 3 NE made at Newsham Lake were *Limnea stagnalis*, and its var. *fragilis*, together with *Planorbis albus* and *P. umbilicatus*.

At the Twyford Forest meeting, *Arion subfuscus* was added to the list for Div. 15 S.

The list for Div. 5 E was already a long one, but it was increased at the Brandy Wharf meeting by the addition of *Succinea elegans*, *Limnea stagnalis* var. *fragilis*, *L. pereger* var. *ovata*, *Planorbis umbilicatus*, *P. spirorbis*, *Unio tumidus*, *Pisidium nitidum* and *P. subtruncatum*.

Our old friend, Mr. C. S. Carter, reports as additional records for the Louth district: *Hyalinia lucida* in 1917, and *Milax gagates* in 1922. At the Bardney meeting, he was very diligent in his searches, and he found the following species which form additions to the list for Div. 7 S: *Vallonia costata*, *Clausilia bidentata*, *Succinea putris*, *Physa fontinalis*, *Bythinia leachii* and *Planorbis contortus*.

ENTOMOLOGY.

A. E. Musgrave.

Very few records have reached me for the last season, so that this report is in the main limited to my own observations, and those of my friend, Mr. A. Sewards, who has diligently worked Lincoln and the surrounding neighbourhood.

Speaking generally, the season has been exceptionally bad for larvae, many species being scarce, or even absent alto-

gether. Beating has been unprofitable. For several preceding years the Oaks in Doddington Wood and district were partially denuded of their leaves by the ravages of larvae, but this year the leaves have almost entirely escaped devastation.

Rhopalocera. The Whites and Orange Tip (*Euchloe cardamines*) have made normal appearances. The Red Admiral (*Pyrameis atalanta*) has been plentiful; I noticed large numbers of them flying in the grounds of Fillingham Castle early in September, and larvae were abundant at Skellingthorpe in August. The Peacock (*Vanessa io*) has been almost conspicuous by its absence. In August I found the Chalk Hill Blue (*Lycaena corydon*) plentiful in the quarry, and the Dark Green Fritillary (*Argynnis aglaia*) in the woods at Ancaster. Plants of Ragwort in the district were smothered by the larvae of the Cinnabar Moth (*Euchelia jacobaeae*). The Small Pearl-bordered Fritillary (*Argynnis selene*) was common at Linwood in June, and there was a second brood in August. I am pleased to report that the Chequered Skipper (*Carterocephalus palaemon*) is apparently increasing in numbers, and has been seen in several localities.

Heterocera. The following are the most noteworthy records:

Lincoln district: *Xylophasia rurea* var. *alopecurius*, *Polia flavicincta* and *Cerura furcula*.

Ballast Pits: *Cerura furcula* (larvae), *Eriogaster lanestris*, *Acronycta leporina*, *Polyploca flavicornis*, *Notodonta ziczac*.

Linwood: *Metopsilos porcellus*, *Panolis griseovariegata* (larvae), *Cucullia verbasci* (larvae), *Ellopia prosapiaria*.

Doddington Road and Six Fields: *Lobophora halterata*, *Eupithecia oblongata*, *Miana bicolaria* (very abundant at dusk), *Ephyra pendularia*.

Larvae of *Macrothylacia rubi* were plentiful near Mablethorpe in October, and Miss S. C. Stow also records them at Skegness.

Two insects of other Orders have been recorded, and both are new to the County:

ORTHOPTERA: *Meconema varium*, found by Mr. Carter at Bardney, where it was beaten out of a Birch tree, September 13th.

HEMIPTERA-HETEROPTERA: *Phytocoris populi*, found at Riseholme, near Lincoln, on swedes under trees, by Mr. A. Roebuck, September 26th.

BIRD NOTES, AUTUMN, 1923.

G. H. CATON HAIGH, F.Z.S., M.B.O.U.

The migratory season of 1923 was far less interesting than that of the previous autumn, the probable cause being that the distribution of pressure over Western Europe was such as is generally unfavourable to the arrival of a large number of migrants on the east coast of Great Britain, a large anti-cyclone remaining practically stationary to the S.W. of our islands, while a continuous string of depressions passed across the Icelandic region to Scandinavia. This resulted in a south-westerly type of weather continuing without intermission throughout the two most important months of September and October.

Nevertheless, even during this unfavourable period, the passage of the usual species was in most cases indicated if only by less than half-a-dozen individuals.

On September 1st, a couple of Pied Flycatchers appeared, with a few Common Whitethroats; and from this date to the 10th a few Whitethroats, Willow Wrens, Reed Warblers and Whinchats were generally present. On the 10th, the first arrival of Wild Geese took place, and there were also some flights of Peewits. On the 15th, a Peregrine appeared; also a considerable number of Wigeon. A few small birds continued to appear on the coast, and to those already mentioned may be added the Lesser Whitethroat, Redstart, Chiffchaff and Wheatear. From the 26th to the end of the month, small birds were rather more numerous, including several Goldcrests, also the Chiffchaff, Blackcap and Pied Flycatcher; and on the 26th, I saw a Ruff. At this period also there was a heavy

passage of Peewits and Starlings, and Geese continued to come in almost every day.

On October 5th and 6th, Peewits came in by thousands, with many Starlings, and a few Grey Crows, Robins and Snipe. On the 12th, two flocks of Jays came in, and from this date to the 26th, large numbers appeared on the coast and spread inland, where they have been exceptionally abundant through the winter.

On the 12th, there was a considerable movement, though no species was abundant. Robins, however, and Blackbirds, Lesser Whitethroats, Goldcrests, Blue and Great Tits, Wrens, Rock Pipits and Jack Snipe were all represented, and I shot a single Yellow-browed Warbler. On the 17th and 18th, Redwings arrived, together with Starlings, Larks, Blackbirds and on the latter day a Merlin.

On the 19th, I shot a Yellow-browed Warbler and a Mealy Redpole. Many Peewits, Starlings, Larks and Linnets were coming in. On the 21st, another Peregrine was seen; and on the 24th, a flock of White-fronted Geese passed over Tetney.

On October 27th, there commenced the most important movement of the season. It increased in intensity till, on the 6th and 7th November, it had reached the proportions of an enormous 'rush'. At the commencement of this movement the chief travellers were Peewits, Starlings, Rooks and Larks, and in less numbers Twites, Finches, Golden Plover and a few Woodcocks. Later on, in addition to the species above-mentioned, large quantities of Fieldfares, Blackbirds and Tree Sparrows joined in the flight; also a considerable number of Wild Swans of both species were observed, mostly along the Humber. A few Short-eared Owls also came in at the end of the movement. This rush was interrupted on the 8th and 9th by bad weather, but continued subsequently till the 12th.

On November 9th, a great slaughter of Pink-footed Geese took place all along the south side of the Humber from Trent Outfall to Goxhill. These unfortunate birds had their wings soaked with fuel oil, and were almost unable to fly. A few

were shot, but many were caught by dogs or knocked on the head with sticks. Altogether, I calculate that quite two hundred Geese perished. Although this is a common event among the sea Ducks, Divers and Gulls, I have not previously heard of it happening to Grey Geese.

On November 17th, an almost unprecedented immigration of Wood Pigeons took place. The birds were travelling in very large flocks, generally from one thousand to five thousand in a flock, and were going west against a strong S.W. wind. A great many remained in the district till the 25th, when they all left. Another great immigration took place on December 8th, and again on the 15th and 16th. These Pigeons were also going west, and in flocks up to five thousand birds.

On November 15th, an Eagle was seen at Grainthorpe Haven by Mr. G. Butt, of Grimsby.

The first Brent Geese, always the latest of our visitors, appeared on January 1st, 1924, and were followed on the 10th, during a spell of frost and snow, by several small flocks of the same species. At this time also a very large number of Wigeon arrived, together with a few Scaup and Shelducks. At the commencement of the new year there was a very considerable influx of Woodcocks, and they were more abundant in the woods than at any time during the season.

I saw no Shore Larks or Lapland Buntings, but Mr. Suggitt, of Cleethorpes, informs me that several of the latter were offered to him by bird-catchers.

The outstanding feature of this season was, in my opinion, the heavy and long-continued immigration of Peewits and Starlings, and subsequently of Wood Pigeons.

BIRDS IN THE SKEGNESS DISTRICT.

FRANK HIND.

The numbers of Wild Geese that passed over the town during the closing months of 1923 were astounding. Day after day, *wisps* were to be seen, ranging from 30 to 500 individuals. On December 28th, considerably more than the

latter number were to be seen feeding on grass-land near Wainfleet. Most of these appeared to be Brent Geese, with the Bean Goose, second in numbers, and the Pinkfoot third. There have also been many Ducks, especially the beautiful Mallard, with Teal, Wigeon and Shovellers. In mid-December, a flight of 30 Whooper Swans passed four miles north of Skegness.

I saw only one Scaup; and one Great Northern Diver was brought to me—it had been taken by hand at Gibraltar Point.

Gulls were extremely numerous during the autumn and winter. Thousands of the Common and Laughing Gulls visited our shore, with fair numbers of Black-backed and Herring Gulls. The latter is powerful and fierce, but makes himself scarce when a Heron appears on the scene. The entry of a cat into an aviary would not cause greater consternation than is created when a Heron alights amid a flock of Gulls. This I have observed on several occasions.

Redshanks were abundant near Wainfleet and Friskney, and there were also several Oyster Catchers, Greenshanks and Bar-tailed Godwits.

Curlews appeared in greater numbers than usual, and flocks of 20 or 30 might be seen feeding at the south end of the Golf Links near Gibraltar Point; with big parties of Stints, Knots and Lesser Terns.

I have noted with pleasure the almost continual presence of the stately Heron in the district. A friend informs me that there were 19 nests in the Heronry at Welton at the time of his last visit.

Turnstones and Oyster Catchers have been seen, and several captured, by our local fishermen and fowlers, but both may be considered rare or infrequent visitors to the district.

Sheldrakes (commonly known here as Shelducks) still visit Gibraltar Point to breed, but their numbers are fewer than formerly, owing no doubt to the disturbing influence of man and beast, for picnic and pleasure parties now frequently

visit this once isolated spot. Snipe seemed to be more abundant than they have been in recent seasons. They are always difficult to approach, and display a businesslike activity in evading gunmen.

The Common Partridge was extremely abundant this season, the conditions early in the year having favoured the hatching and upbringing of a big progeny. The same remark applies to the bird that locally dominates the picture—I mean the Starling, which has been seen in huge flocks. To those unacquainted with the habits of this bird, it must be a mystery how such vast numbers can find sustenance, but I think that no bird is better fitted to its environment. It is vigorous in movement, powerful in flight, fearless of attack, almost proof against cold and fatigue, nearly omnivorous in diet, and it is gregarious. It is then no wonder that its numbers increase. Those who wish for diversion and delight without the payment of an Entertainment Tax have merely to watch these birds either in the winter or the summer.

Great numbers of Plover visit the district, the Golden Plover predominating: and the Moorhen may constantly be seen on and around the waters of the deep claypits.

The Kingfisher has increased in numbers during the last three years; but, so far as I can ascertain, the Cuckoo was seen and heard last summer on fewer occasions than ever before.

The first Martin of 1923 appeared on April 27th, followed on the 29th by the Swallow; and by the Swift on May 3rd, an unusually early date for the last species. The Swift remained with us until October 28th, and three days before its departure the Royston Crow arrived. I may remark that I have never seen a Swift resting on a tree-branch or a fence-rail, though on several occasions I have taken it on the ground in a benumbed or storm-battered condition. It does not resort to pools of water to drink, but appears to get sufficient moisture from the bodies of the flies on which it feeds.

Magpies are common at a place called *Magpie Holt*, where upon occasion as many as 40 may be seen.

I was under the impression that the Hawfinch had become a *rara avis* in this district, but I have been informed by a fowler-friend that he saw great numbers a few miles north of Skegness last year.

BOTANY.

Miss S. C. Stow.

There is nothing of great importance to record, no new or very special plants having been noted in the County during the season, but lists have been made at all the meetings, and they contain many notes that have been entered on the L.N.U. Plant Register.

Miss Marsden found *Crepis taraxacifolia* at Withcall, thus making a new record for the well-worked Louth district.

More than 400 species were collected in the Grantham district, and they were shown on the Wild Flower Table at the Grantham Museum, the best species for the district being Wood Vetch *(Vicia sylvatica)*, Cotton-Grass *(Eriophorum angustifolium)* and Butterwort *(Pinguicula vulgaris)*.

Of Mosses, only a few common species have been recorded.

Several new Galls have been gathered, and they will, with the records of the last three years, form a short note for the Transactions.

A specimen of the Feather-grass (*Stipa pennata*), an escape, was sent in from Allington. Fortunately, it has not become naturalized here. In Russia, Queensland, New Caledonia and North America, this and other allied species often kill sheep. The seeds have a sharp, hard point, stiff hairs pointing downwards on a long twisted awn, ending in a long, beautiful feathery tail, which is highly hygrometric, straightening itself in wet weather, and in dry weather coiling into corkscrew spirals. Thus, when a seed falls on the ground, every coil and twist forces it further into the earth. The same process goes on when a seed falls on a sheep's back. In John Ray's *Synopsis*, 1724, p. 393, it is stated to have been found by Dr. Richardson, in company with Thomas Lawson, on the limestone rocks hanging over a little valley, called Long Sleadale, about six miles north of Kendal, in Westmorland.

BRITISH
MUSEUM
27 JAN 30
NATURAL
HISTORY.

JOHN F. MUSHAM, F.E.S.,

President, 1920.

The Nineteenth President
OF THE
Lincolnshire Naturalists' Union.

J. F. MUSHAM, F.E.S., M.C.S.

IT gives me great pleasure to place on record a few of the achievements of this versatile naturalist, through whose efforts the knowledge of the zoological and antiquarian treasures of Yorkshire and Lincolnshire has been considerably extended, as a reference to *The Naturalist*, the *Transactions* of both the Yorkshire and Lincolnshire Unions, the *Journal of Conchology*, the *Reports of the Yorkshire Numismatic Society*, *Spink's Numismatic Circular*, and privately published lists testify.

Mr. Musham is a born collector, and follows up a clue of anything required with a persistency which frequently has resulted in success where others have failed. The present writer is considerably indebted to him for specimens varying in size from nut-crackers to old fashioned turnip cutting machines, and from coins and tokens to bygones, and rarely has he expressed a wish for any particular object necessary for one or other of the Museums under his charge, but Mr. Musham has been able to fill the gap. The Spalding Gentlemen's Society, of which he is an honorary member, the Scunthorpe and Grantham Museums have also benefited by his aid.

Mr. Musham was born at York in 1865, and was educated at the old Grammar School, Lincoln, then known as the Old Grey Friars, a building which now forms the County Museum. As a field naturalist he was self-taught. In his early days he was a member of the one-time Lincoln Science Society, and at first was interested in the local birds. He was elected a member of the Lincolnshire Naturalists' Union in 1901, and he was President of the Union in 1920. He was a friend of the late John Cordeaux and, as a successful taxidermist, he

had the privilege of preparing many of the more valuable specimens in the Cordeaux collection. Mr. Musham's notes and observations were frequently of value to the compiler of "The Birds of the Humber District."

That Mr. Musham has kept in touch with his old love is proved by the number of gifts of birds and mammals which he has made to the Lincoln Museum. At the time of the death of Cordeaux, the local Lepidoptera had apparently been neglected, and this subject was taken up by Mr. Musham with his characteristic energy and enthusiasm, the results of his labours being generously presented to the County Museum.

The late W. Denison Roebuck and others found in him a ready and willing helper, and his services were enlisted in the preparation of a list showing the distribution of our non-marine Mollusca, the earlier results of which were first issued in a privately printed pamphlet with a very limited edition, one copy of which is among the treasures of the present writer's collection. As President of the Mollusca section he later brought out the county check-list compiled from the Register and manuscripts of the late W. D. Roebuck. Neither time, trouble, nor expense was spared in the preparation of this particular list.

On returning to his native county in 1909, Mr. Musham became connected with the Selby Scientific Society, the successful position of which at the present moment is unquestionably due to his work. For ten years he was its Hon. Secretary; he then became the President (in 1917), and on his retirement in consequence of leaving the county, he was presented with a purse of gold, suitably inscribed. A prominent member of the Yorkshire Naturalists' Union, Mr. Musham's services are much appreciated in the various sections and committees of that organization, particularly the Wild Birds and Eggs Protection Committee. He was elected a Fellow of the Entomological Society in 1909; he has long been a member of the Conchological Society of Great Britain and Ireland. That Society is indebted to him for the additions he has made to the census list of the Southern Hebrides during

the visits he has paid to the islands of Jura, Colonsay and Islay, as well as Iona.

His additions to the local lists, as well as his collection of shell-necklaces, are now in the Conchological Society's collection. The Leeds Conchological Club, a branch of the larger Society, secured Mr. Musham as a member; he was its President in 1915, and to this body he made a number of contributions, including one of the beautiful genus *Cochlostyla* and its kindred forms, from the Philippine Islands. As showing the various directions in which his researches run, Mr. Musham is an old member of the Yorkshire Numismatic Society, has contributed valuable papers to its Reports, and has carried out original research in connection with Victorian Imperial Copper and Bronze Coinage, having made many additions to our knowledge of this subject. His collection of these specimens is probably as complete as any in the kingdom. The papers he has printed on this subject indicate that in that direction also he did not rest until he had exceeded other collectors.

For two years he had the honour of being the President of the Yorkshire Numismatic Society, during which he had the privilege of presenting the first two silver medals issued by that Society to members who had contributed to Yorkshire Numismatics. He will shortly be the recipient of a similar medal, at the hands of the present President.

Ever ready to take up some neglected branch of study, a few years ago he began assisting the present writer in gathering together various forms of money scales and weights, with the result that the collection now in the Hull Museum contains nearly four hundred distinct varieties of balances for money, dating from Roman to Victorian times. An illustrated account of this has appeared in the *Numismatic Circular* during the past two or three years, and will shortly appear as a complete volume.

By the handling of an enormous number, Mr. Musham was able to classify the weights used between Elizabethan and modern times, in connection with the weighing of money, and his collection of these was not finished until he probably ex-

ceeded in variety and importance any other collector in the country. These specimens are now preserved at Hull.

The trait in Mr. Musham's character which is outstanding is his earnest desire to give assistance to those who require it, and appreciate it; and although for many years he has not been occupied in business, it can safely be said that each day has probably seen more work from him than were he earning his living; the work, however, being for the benefit of others.

T. S.

THE SUBMERGED FOREST ON THE COAST OF LINCOLNSHIRE.

By Neil S. Stevenson,
Forestry Department, University of Edinburgh.

Many papers and reports have been written about the curious strip of clay seen down the Lincolnshire Coast, a strip fairly well known to the local inhabitants and visitors as 'the submerged forest'. Each report deals with a different aspect of the subject, and a paper comparing and summarising the results of others, and offering new facts and theories, will not be out of place. An attempt, therefore, will be made to set out the present aspect of the 'forest' as compared with that of years ago, to name the species of trees found, to indicate the probable mode of preservation, and to give some idea of the age of the trees, or the date of submergence.

Two examinations of the submerged forest, more or less rough and haphazard, were made in September 1921 and September 1923, before any reports had been consulted, and without any idea of the multitude of facts connected with the forest.

In September 1921, at Sutton-on-Sea, the forest was exposed for a considerable distance down the coast during an exceptionally low ebb of the spring tide, and this fact was reported in the daily press on the following day, when it was stated that 'the submerged forest was uncovered for eleven miles down the coast from Mablethorpe towards Skegness',

SUBMERGED FOREST, SUTTON-ON-SEA.

General View, looking n.e., September 1921.

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Photographs were taken on this occasion, and the general nature of the 'forest' noted.

In September 1923, at Trusthorpe, about $1\frac{1}{4}$ miles further up the coast, the 'forest' was again examined, and photographs obtained.

The following are the combined observations of 1921 and 1923:

The 'submerged forest' runs approximately parallel to the coast line, about a quarter-of-a-mile or more from the sand-dunes. At Trusthorpe, the distance between the nearest part of the clays on which the forest lies and the dunes was roughly paced out, and was found to be about 300 paces, or more than 300 yards. The 'forest bed' at first sight appears to be a long narrow strip of clay, from which project the broken stumps of trees much worn and rotted, standing up to three feet above the surface of the clay in which they are embedded. This strip is only partially uncovered by the lowest ebbs of the spring tides, and the outer limits are not seen, so that the actual width of the 'forest bed' cannot be determined. At one particular low tide at Trusthorpe, the width of the clays uncovered must have been from 100 to 150 yards, the outer portions being visible only as isolated patches of clay appearing above the surface of the sea. It was noticed that the tree stumps did not appear on those patches, and that the forest here had a maximum width of about 100 yards. Whether this is a constant feature down the coast is very uncertain.

The clay varies in colour from green to black, and is fairly soft, though generally firm to stand on, especially where it is covered with peat, which occurs in patches. The clay is broken up into small banks and ridges by fairly deep fissures, usually running at right angles to the sand-dunes. The peat at Sutton, which is found here and there above the clay, is made up of leaves, twigs and small branches beaten down into a solid, compact mass, much resembling the surrounding clay until examined closely. A small block of this peat cut out with a penknife was found to consist chiefly of leaves, much

discoloured and very fragile, laid down in a horizontal position. No attempt was made to remove any of these leaves, or to identify them, though the block broke up very easily in the horizontal plane.

The peat was not examined at Trusthorpe, where, however, a curious muddy kind of soil was noticed overlying the patches. This was found over the peat only, and not on the clay.

The stumps of the trees, which had evidently grown *in situ*, were still firmly attached by roots to the clay. They were much worn, and tended to be more or less conical, due no doubt to the constant friction of sand in the moving water. The outer layers of wood were rotten, and in some cases were covered with calcareous deposit. The inner wood, however, though much discoloured, was still whitish in parts and quite sound. The annual rings were clearly shown on some stumps as a series of ridges formed by the more rapid erosion of the softer parts of the annual growth. At the bottom of some of the stumps, bark was found protected by the peat from external influences, and several inches thick. This bark was found to be in fresh condition inside, and it split up evenly into flakes.

The roots, which are still present, are large, but much softer than the wood of the stump, and they are quite sodden and rotten.

At Sutton, one trunk only was found. It had fallen towards the sea, and was lying embedded in peat. The top only was left, the lower part having been undermined and washed away between the top and the only stump from which the trunk could possibly have fallen. This stump was quite isolated. The species was not determined.

At Trusthorpe, small pieces of branch were found, but no large trunks.

At Sutton, a piece of a branch was found embedded in the peat, with the characteristic bark of Birch still attached. This bark could be pulled off in thin silvery layers, and was quite fresh.

At Trusthorpe, the annual rings on one large stump were

counted, and though more than fifty were plainly evident on the worn portion, the tree, judged by the size of the trunk protected by peat, must have been well over 100 years old. Fifteen specimens of wood were cut for examination from stumps of varying sizes, from a strip of 'forest' about half-a-mile long, and one small piece of wood lying in a pool was also taken. This last, however, may be merely drift-wood, and examination seems to confirm this supposition. The fifteen specimens were examined microscopically, and were found, without exception, to belong to the group of hard Pines, and are in all probability Scots Pine, while the loose piece was Ash.

The wood of the stumps was found to be eaten away by a small crustacean *Limnoria*, or the 'Gribble', which is very common on timber in the sea. It never burrows far in, but as the outside rots away, it gets gradually nearer and nearer to the centre. No sign of the Shipworm was found in the piece of wood submitted to a friend for examination.

It was noticed that many of the stumps had a decided lean towards the sea or to the north-east. This fact is mentioned in the Lincolnshire Directory, where it is noted that 'trees lining the drains at Holbeach point in the same direction as the stumps of the submerged forest on the coast, and in the direction of the S.W. winds'.

Unfortunately, the extremely rapid rise of the tide allows very little time in which to examine the stumps, and the sea flows in with surprising swiftness through the depressions in and over the clay.

Further information concerning the forest bed was obtained by the perusal of several reports, quotations from which will not be out of place.

The first quotation is from the Transactions of the Royal Society in 1796, and when we compare it with the foregoing account, we are compelled to conclude that the remains of the forest have been gradually washed away by the encroaching tides.

'In the month of September 1796, the narrator (Mr.

De Serra) went to Sutton, on the coast of Lincolnshire, in company with Sir Joseph Banks, to examine their extent and nature. He visited them again in the ebbs of the tide; and though it generally did not ebb so far as he expected, he could, notwithstanding, ascertain that they consisted almost entirely of roots, trunks, branches and leaves of trees and shrubs, intermixed with some leaves of aquatic plants. The remains of some of these trees were still standing on their roots; while the trunks of the greater part lay scattered on the ground, in every possible direction. The bark of the trees and roots appeared generally as fresh as when they were growing; in that of the birches particularly, of which a great quantity was found, even the thin silvery membranes of the outer skin were discernible. The timber of all kinds, on the contrary, was decomposed and soft, in the greatest part of the trees; in some, however, it was firm, especially in the knots.....The sorts of wood which are still distinguishable are birch, fir and oak. Other woods evidently exist in these islets, of some of which we found the leaves in the soil; but our present knoweldge of the comparative anatomy of timbers is not so far advanced as to afford us the means of pronouncing with confidence respecting their species. In general, the trunks, branches and roots of the decayed trees were considerably flattened.....This moor extends all over the Lincolnshire fens, and has been traced as far as Peterborough, more than 60 miles to the south of Sutton. On the north side, the moory islets, according to the fishermen, extend as far as Grimsby..... ..The soil to which the trees are affixed, and in which they grow, is a soft greasy clay, but for many inches above its surface is entirely composed of rotten leaves scarcely distinguishable to the eye.....I obtained some perfect leaves of *Ilex aquifolium*, and some other leaves which, though less perfect, seem to belong to some species of willow.

In this stratum of rotten leaves we could also distinguish several roots of *Arundo phragmites*'.....

My second quotation is from A. J. Jukes Browne's Geology of East Lincolnshire:

'I examined the *forest bed* at Mablethorpe during the spring tides of July 1881, when it was well exposed at dead low water. I found it cropping out at the bottom of a gentle slope, composed partly of clay and partly of sand lying on the clay, under which the turf or *forest bed* appeared to pass, as shown below:

c
b
a

a Forest Bed b Clay c Sand

...The peat bed seems to be from a foot to a foot and a half thick; it consists of a black matted mass of roots, twigs, leaves and pieces of bark, in which numerous stumps of trees are standing up in position of growth'.....

This record goes on to prove, by means of the figures obtained in well borings and quarries, that the forest bed extends under the fen country round the coast at a depth of about 16 feet, and this may be taken as correct.

The next quotation, which is taken from *Fenland Past and Present*, by S. H. Millar and S. B. J. Skertchley, gives a good idea of the growth of the peat which has successfully preserved the remains of the forest until the present time almost exactly as the trees fell and were buried:

'The bark has generally crumbled away, except on the lower surface. This indicates that the growth of the peat was slow, and that the bark on the upper surface decayed by exposure, while that beneath, being in contact with the peat, was preserved. The great thickness of the bark is very noticeable, especially in the case of firs, and indicates a cold climate.....

That the trees fell under the influence of the S.W. wind admits of no doubt, but it affords only a fragment of the explanation of the phenomena of the buried forests. Suppose the peat to start growing now as vigorously as ever, any tree accidentally uprooted would fall and be entombed in the moss, but such catastrophes are so few and far between that they afford no explanation of such immense numbers of trees *upon the same level* lying close together. A solitary stem here and there would be the sole token of the aerial vigour. Clearly, whole forests must have died at a time. Something must have killed them. A ready solution of this problem is afforded by an examination of the tree stools, and, curiously enongh, it is found in one of the phenomena which were pointed out as proving the intentional destruction of the trees by man.

If we examine any district...where numerous stools are visible at one time, we shall notice that they are all broken off at about the same height; generally about three feet from the former ground level. If now we compare this height with the thickness of the peat, we shall soon convince ourselves that the peat once stood at just that height, and that it was *the cause of the destruction of the trees.*

Let us imagine a forest in the full force of vegetative vigour, in a tolerably well drained area. Now let peat begin to grow. It will gradually creep up the trunks of trees, and keep them constantly cold. Eventually the peat moss, cold and wet, will become so thick that the trees will be chilled to the heartwood. The sap will no longer be able to rise. The trees, which have long been languishing, will die, and for years stand gaunt, leafless and dead. The dry, withered branches will crack and fall with every passing breeze. The trunks will rot at the surface of the peat, where they are exposed to the air and to continual moisture. Finally, the trees will go down

> before the strong S.W. gales, and the peat, their destroyer in life, will become their preserver in death. But what causes the peat to grow? Ask rather, what allowed the forest to grow, for peat is the rule, forests are the exception in the Fens. What checked the growth of the peat? It was not that the climate grew milder, for the thickened bark proclaims its severity. One explanation only can be given: the supply of water was stopped—the land became drier. Whether this was due to improved natural drainage, or to cosmical changes, may be answered by taking a broad view of the subject. Forests and peat can no more live together than crabbed age and youth, yet all the British Isles, all northern Europe and North America proclaim the fact that forests have flourished *upon* peat and been buried *in* peat.
>
> Any local explanation of improved drainage fails, then, to meet the requirements of the situation. It must have been a cosmical change'.....

So much for the preservation of the timber and stumps. Swampy conditions must have obtained in these forests to allow the peat to grow, and this aids in determining the age of burial in the Fen deposits, and of the submergence in the case of the forest on the coast.

The submerged forest on the coast must be older than the buried forests of the Fens for the following reasons:

(1) The level of the coast 'forest bed' is sixteen feet below the level of the land immediately behind the sand-dunes, and therefore much below the forests of the Fens which are present only as a fringe at the surface of ground where the hills meet the alluvial deposit, under which the coast forest lies;

(2) Of fifteen specimens of wood taken for examination, all were Scots Pine, and as these were obtained over a fairly long strip of forest bed, the composition of the ancient forest now off the coast must be chiefly Scots Pine.

Here may fittingly be introduced an excerpt from *The Forests of England*, by Dr. John Croumbie Brown: 'In the vast

bogs of Denmark, from which have been lately taken more than a million of trees, the succession of different kinds of indigenous trees is as distinctly marked as the successive periods of geological strata. Lowermost are found the Scotch Fir (Scots Pine); next, the Oak; nearest to the surface, the Beech. Each of these must have had its reign, and apparently an exclusive reign, and each in its turn may claim to have been indigenous'.

The species found in the Fens are Oak, Fir, Birch, Willow and other species, but there is a preponderance of Oak. This means that the forests in the Fens were laid down later than those on the coast.

The authors of *Fenland, Past and Present* calculate the age of the Fenland forests in this way. The so-called Roman Bank in the Fens is now four miles from the sea, and it has therefore taken at least 1700 years to deposit the silt between the Bank and the sea. The buried forest, however, is twelve miles from the Bank, and supposing that the rate of deposition of silt was uniform, then these twelve miles of silt were deposited in about 5,100 years. That is to say, the age of the Fen forest deposits must be about 7,000 years, and the age of the coast forest must therefore be greater.

Now, according to the Drayson Theory, a Glacial age occurs (roughly speaking) every 30,000 years, and after each Ice Age there is a gradual melting of the ice caps at the poles, with a consequent rise of sea level. This rise is supposed to have accounted for the submergence of land between England and Denmark, and as the huge trees found in the Fens could not have grown on an exposed sea coast, the Fen Forest was well inland, and this was probably the case with the present coast forest during its period of growth. Then, as the forests have obviously been stopped by the deposition of silt (well shown in the Fens), the land must either have subsided, or the sea must have risen. According to the Drayson Theory, the sea rose, and the change after the low temperature of the Ice Age resulted in the cosmical change mentioned in the growth of the peat.

Supposing, then, that one rise of water destroyed the Fen deposits, a previous one must have destroyed the forest on the coast. That is to say, the coast forest must be at least 37,000 years old.

The fact that the last Glacial Age is put down as 80,000 years ago (Hessle Boulder Clay in Lincolnshire) can be explained by the supposition that the latest Ice Ages were not so severe, and the effects were not marked in this part of the country. The Midlands of England are supposed to have been about the average extremity of the ice cap, so that some variation may be allowed for.

Thus, the age of the coast forest must be 37,000 years at least, but it may easily be more, in which case the age would increase by multiples of 30,000 years.

It is hoped that this summary of existing reports and papers, together with the detailed account of the present nature of the submerged forest may stimulate further study of this intensely interesting subject. It is unfortunate that the forest is so inaccessible, the greater part of it being always under water, and the rest being visible only at long intervals. The Fen forest deposits are of great use in determining the age of the coast forest, as they supply many data that could not otherwise be obtained, for the submerged forest must be gradually disappearing under the influence of the tides.

In the composition of this paper I have received much assistance, and I wish to express my thanks to Mr. Arthur Smith, of Lincoln, who helped considerably in providing books of reference; to Major R. A. Marriott, of Cheltenham, who has written several papers on the Drayson Theory, and who explained many obscure points in that Theory, which is based chiefly on the evidence of buried forests; and to Mr. C. M. Yonge, B.Sc., of Edinburgh, who examined some of the wood to ascertain if it contained marine borers.

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